1853MNRAS..14...38S

reconcile with this hypothesis, that is its proper motion, differing from that of the fixed stars, and greater than could arise from its motion in its orbit. But, considering that the tail of a comet is a fluid which cannot be classed under what is generally termed heavenly bodies, its motion cannot be put to the mathematical test before its nature is better known. It is, moreover, well known that motion has been observed in the tails of several comets, and that it consists of rays which project in short intervals of time, considerably more or less, like those of an aurora borealis.

As these points appertain to physical astronomy, I must leave them to those who are better versed in that part of the science, and confine myself to the following remarks. The distance of the comet from the earth was too great to allow a contact of its expanded tail with the atmosphere of the earth. But, notwithstanding, the phenomenon might have been an atmospherical one caused by the tail of the comet, as there are perihelia round the sun and halos round the moon, rainbows, &c. &c., which expand and contract, and are generated in the atmosphere. And although there have been observed more auroræ boreales than comets, there certainly also exist more comets than those that have been discovered; and it has already been remarked by others, that our earth may often have been enveloped in the tail of a comet without our having been aware of it.

Extracts of a Letter from Professor C. Piazzi Smyth relative to Cometary Physics and to the Rating of Chronometers by Lunars.

"It is generally believed that the tails of comets are only put on near the perihelion point of their orbits; that they are produced by the intensity of the sun's rays there, and are dissipated on either side. Now I maintain that this is the reverse of what actually takes place. The comets have all the particles of their mass, whether tail, body, coma, &c., always with them; though in very different states of concentration at different times: and this it is which, combined with the greater or less intensity of solar illumination, according to their distance from the sun, and the greater or less angle under which they may be seen by reason of proximity to the earth, causes the variations in observed appearance. Moreover, it is now found that all comets, large and small, invariably become not only smaller, but more compressed and concentrated, as they approach the sun; and so far from a dissipation of solid matter, there is a bringing together of it, and a consequent brightening. The tail, indeed, shuts up like a many-draw telescope as it nears the perihelion, and opens out again as it leaves it. The amount of such concentration appears to vary in a proportion not yet accurately ascertained with the length of the radius vector or distance of the comet from the sun. So that, with such comets as Encke's and Biela's, where the difference of perihelion and aphelion distances is not very great, the amount of concentration is never considerable, and they are never

1853MNRAS..14...38S

seen but as faint, vaporous, telescopic bodies. But when the aphelion distance is very great, and the perihelion distance very small, as with the comet of 1843, and to a much less extent with the third one of 1853, then so great a concentration occurs, there is such a bringing together of finely divided matter, that, though otherwise invisible, it is now able to reflect the sun's rays so strongly as to become abundantly apparent to the naked eye in the evening, and finally, at the perihelion passage itself, for a short time even in open daylight."

"I may further remark that, in consequence of the concentration of matter which ensues as the comet approaches the perihelion, much confusion arises from speaking of the length of a comet's tail without a qualifying note of the part of the comet's orbit at the time. The same reasoning applies to every other part of the comet, for it is all vaporous, but the nucleoid centre. Here, if anywhere, is the solid body, but it is infinitely small. The old writers do, indeed, talk of very large nuclei in former comets, and that of the present one has been described to have been, on August 27, upwards of 9000 miles in diameter, or enough to revive the old fears lest it should come in contact with the earth and break it to pieces. But that was not the nucleus, it was only the head round about it, that head being composed of the thinnest and lightest of conceivable vapour, merely rendered apparent there by the particles being brought very close together, and the whole so near the sun as to be lighted up by a more than ordinary blaze of light, and then to shine forth like a luminous object, as a thin cirrus cloud so often does when seen in the neighbourhood of the solar orb."

"Exactly the same appearance was observed at the similar part of its orbit in the great comet of 1843, when everything being on so much larger a scale, its internal economy could be better studied, and a powerful reflecting telescope actually showed the transparency, exhibited stars shining freely through that which persons with smaller telescopes were calling the solid nucleus. Day by day, too, as the comet left the perihelion, the once solid-looking head expanded and enlarged, and its outline became indistinct, and the whole was at length lost to all view, from being so rarified as neither to be able to reflect back any of the rays of the sun, nor to stop that coming through it from the smallest of the stars in front of which it passed."

* * * *

"As to the difference between the results of different lunars, Captain Toynbee should be advised of the probability of its arising from errors of the Tables; *i.e.* of the moon's place in the *Nautical Almanac.*

"For this amounts, in some parts of a month, to 15″ or 20″; and as it varies with opposite signs throughout the month, that is a reason why he finds lunars a fortnight apart, taken together, give a better result than two taken on following days.

"Again, if he can show that sensible errors to sailors arise from

1853MNRAS..14...40C

the errors of the Lunar Tables in places in the *Nautical Almanac*, it will be a very strong argument for new Lunar Tables being made, based on all the recomputed Greenwich Observations, including the discoveries of Hansen, Adams, and others.

"Further, he should never depend on *Nautical Almanac* or anything else for the diameter of any heavenly body, but measure it for himself with his own instruments, and, comparing the result with the *Nautical Almanac* for the time, get the correction due to that cause: and always apply this correction in any case wherein the *Nautical Almanac* value must be used, as when the moon is near conjunction."

Remarks by Mr. Carrington on presenting to the Society printed Copies of Nine Circumpolar Charts.

"I have the pleasure this evening to present to the Society printed copies of nine draft maps, on a scale of an inch and a half to the degree, containing all the stars above the 11th magnitude, and many of the 11th within 9° of the north pole. These maps are the result of a first examination of the region I have selected for observation, and were formed principally with the object of making a provisional catalogue for my own use, during the second stage of accurate observation on the meridian. They have been entirely executed with my $4\frac{1}{2}$-foot equatoreal, described in the last *Monthly Notice*.

"The process followed in their construction was first to zone over the region in two broad zones, of which the first extended from 4° to $9^\circ\frac{1}{2}$, N.P.D., and the second from 5° above to 5° below pole. From March 25th to May 20th of the present year, 20 zones were thus observed, which, when reduced and cleared of duplicates, yielded about 2000 net points for a foundation for the maps. The degree of accuracy attained was quite sufficient for the purpose. The stage of filling in was then proceeded with, and terminated on Nov. 8th. In each case a skeleton map was first prepared of the stars observed in the zones, and then filled in by estimation, considerable pains being taken to get satisfactory alineations. The map was then copied on a glass desk, through which the light of the sun was made to pass; and the copy was again compared with the heavens, a general revision and the adjustment of the relative magnitudes being chiefly attended to. It is the date of this second comparison which is given on the maps. From this corrected copy two copies were taken; one in common ink for my final standard copy, and one in anastatic ink for transfer by the printer, whose proofs were compared with and corrected by my standard copy.

"My printer was Mr. Rudolph Appel, of No. 43 Gerrard Street, Soho, and his charge for fifty copies of the same map, including cost of transfer and paper, twelve shillings. Believing that the anastatic process of printing has not been previously applied to the ready and cheap production of star maps, I beg to call attention to these maps, as specimens of what may be done, and to add at